CDR® POMPE S.p.A.

Lined

USER MANUAL

INSTALLATION, USE AND MAINTENANCE MANUAL

EN

ETN Lined
MIEN002 Rev. 08
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General Terms & Conditions

1. The following terms and conditions apply to the sale of machinery, components and related services and products, of C.D.R. Pompe S.p.A. (hereinafter “the products”)

2. C.D.R. Pompe S.p.A. (the manufacturer) warrants only that:

   a.) its products as being free of defects in material, design and workmanship at the time of original purchase;
   b.) its products will function in accordance with CDR Pompe S.p.A. operative manuals; CDR Pompe S.p.A. does not guarantee that the product will meet the precise needs of the Customer, except for those purposes set out in any invitation to render documents or other documents specifically made available to CDR Pompe S.p.A. before entering into this agreement;
   c.) high quality materials are used in the construction of the pumps and that machining and assembly are carried out to the highest standards.

   Except as expressly stated above, CDR Pompe S.p.A. makes no warranties, express or implied, concerning the products, including all warranties of fitness for a particular purpose.

3. This warranty shall not be applicable in circumstances other than defects in material, design, and workmanship. In particular warranty shall not cover the following:

   a.) Periodic checks, maintenance, repair and replacement of parts due to normal wear and tear (seals, O-rings, rubber items, bushings, etc..);
   b.) Damage to the product resulting from:

   b.1.) Tampering with, abuse or misuse, including but not limited to failure to use the product for its normal purposes as stated at the time of purchase or in accordance with CDR Pompe S.p.A. instructions for use and maintenance of the product, or the installation or improper ventilation or use of the product in a manner inconsistent with the technical or safety standard in force;

   b.2.) Repairs performed by non skilled personell or use of non original CDR parts.

   b.3.) Accidents, acts of God or any cause beyond the control of CDR Pompe S.p.A., including but not limited to lightning, water, fire, earthquake, and public disturbances, etc.;

4 The warrantee shall cover the replacement or repairing of any parts, which is documentedly faulty due to construction or assembling, with new or repaired parts free of charges delivered by C.D.R. Pompe S.p.A. Parts subjected to normal tear and wear shall not be covered by the warranty. CDR Pompe S.p.A shall decide as to whether the defective or faulty part shall be replaced or repaired.

5 The warrantee of the products shall be valid for a period in accordance to the current law from the date of delivery, under the condition that notice of the alleged defect to the products or parts thereof be given to CDR Pompe S.p.A. in written within the mandatory term of 8 days from the discovery.

6 Repair or replacement under the terms of this warranty shall not give a right to an extension to, or a new commencement of, the period of warranty. Repair or replacement under the terms of this warranty may be fulfilled with functionally equivalent reconditioned units. CDR Pompe S.p.A. qualified personnel shall be solely entitled to carry out repair or replacement of faulty parts after careful examination of the pump. Replaced faulty parts or components will become the property of CDR Pompe S.p.A.

7 The products are built in accordance with standard CE normative and are tested (where applicable) by C.D.R. Pompe S.p.A. Approval and tests by other control authority are for the customer’s account. The products shall not be considered defective in materials, design or workmanship if they need to be adapted, changed or adjusted to conform to national or local technical or safety standards in force in any Country other than that for which the unit was originally designed and manufactured. This warranty shall not reimburse such adaptations, changes or adjustments, or attempt to do so, whether properly performed or not, nor any damage resulting from them, nor any adaptation, change or adjustments to upgrade the products from their normal purpose as described in the products operative manual without the prior written consent of CDR Pompe S.p.A.

8 Installation, including electric and other connections to utility mains according to C.D.R. Pompe S.p.A. drawings, is for the cost and responsibility of the customer, unless otherwise agreed in writing.

9 CDR Pompe S.p.A. will not be liable on any claim, whether in contact, tort, or otherwise, for any indirect, special, incidental, or consequential damages, caused to the customer or to third parties, including loss of profits, arising by any possible infringement of par. 3 above or by the customer or third parties being in the impossibility of using the products. Steady the above, CDR Pompe S.p.A. liability to the customer or third parties from any claim, whether in contract, tort, or otherwise, shall be limited to the total amount paid by the customer for the product that caused the damages.

10 This agreement shall be interpreted, construed and governed by the Italian law. Any dispute arising out of or in connection with this agreement shall be submitted to the exclusive jurisdiction of the Court of Milan.

1 General information

1.1.1 Introduction

This manual refers to centrifugal pumps model **ETN Lined** size 50 and 60.

C.D.R. Pompe S.p.A. would like to thank you for choosing our products.
We believe that with a correct installation and proper use of this product you will achieve the best results, therefore please read this manual carefully before undertaking any operation on the pump-motor unit.
Any use other than that described herein is considered incorrect and therefore C.D.R. Pompe S.p.A. shall not be held responsible for any damages to people or things. In case of doubt or enquiries, please apply to our technical service directly at the following address:

C.D.R. Pompe S.p.A.
Via Togliatti 26/A
I-20030 Senago, MI
Tel. +39 02 990 1941
Fax: +39 02 998 0606
info@cdrpompe.it

UK Branch:
CDR Pumps (UK) Ltd.
Finedon Road Ind. Est
Wellingborough
Northants – NN8 4ST
Tel. 08707 561428
Fax: 08707 561429

1.2 Purpose of the Manual

This manual supplies the user of the pump-motor unit manufactured by C.D.R. Pompe S.p.A. the necessary information for the correct installation, use and maintenance in compliance with safety conditions prescribed by the current CE standards.

1.3 Application Fields

The centrifugal pumps with magnetic coupling model **ETN Lined** are designed to transfer a variety of different liquids with temperature ranging from –5°C to +90°C, maximum viscosity 400 cSt (after recalculating performances) and with maximum system pressure as specified on chapter 9, page 26.

Such figures however depend on the size of the pump, the type of materials used and the pumped liquid.

The ETN 50 and 60 Lined pumps **do not** have Self-Priming capabilities.

The operating conditions and hence the proper working range for which the pump and its components have been selected, are described in the technical sheet released with the order.

Should you need to change the type of service for which the pump has been selected and purchased, please contact C.D.R. Pompe S.p.A.'s technical service before any change is applied. The user is responsible for any damage caused to person or property if such damage is determined by non-compliance with the operating conditions agreed at the time of the Order Confirmation and the information contained in this manual.

It is also Customer's responsibility to:

- Verify the suitability of the pump-motor unit to the working environment
- Provide operators with proper protection and safety devices.
- Provide operators/users with complete information concerning proper use and functioning of the pump.

1.4 Copyright

This manual and the information herein is sole property of C.D.R. Pompe S.p.A., who reserves the right to change its contents without prior notice. It contains technical information and drawings that are property of C.D.R. Pompe S.p.A. No parts of this manual can be reproduced in any form without prior written consent from C.D.R. Pompe S.p.A.

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The names **ILS**™ and **FTC**™ are registered Trademarks and Trade Name of C.D.R. Pompe S.p.A.

1.5 Pump Identification

Each pump is provided with a data plate containing the following information:

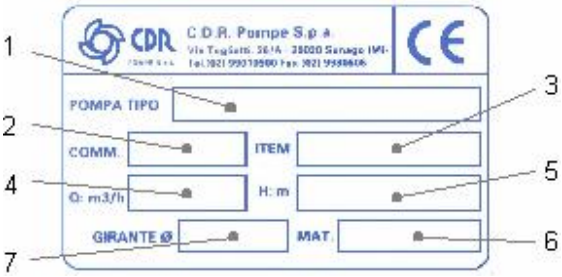
1. Pump model
2. Serial No.
3. Item (when requested)
4. Capacity
5. Head
6. Material in contact with liquid
7. Diameter of impeller

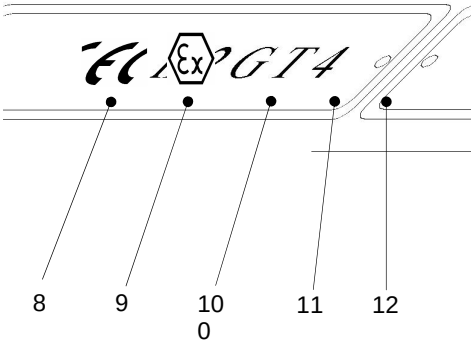
For applications with Ex-proof requirements, an additional label is placed on the pump. On the label you will find the following information:

8 CE logo
9 Ex protection Logo
10 Equipment Group
11 Explosive Atmosphere class:
G = Gas

12 Temperature class:

The maximum effective surface temperature depends above all from the operative conditions of the process liquid of the user (UNI EN 13463-1 art.6.1.3).
When requesting spare parts, assistance or information concerning the pump supplied, the serial number must be always provided. Please make sure to have the serial number handy before contacting CDR Pompe S.p.A. service.





2 Safety

2.1 Introduction

This manual contains all the information needed for the correct installation, use and maintenance of your new CDR pump. It should be read and understood by all the personnel involved in installation, operating and servicing of the pump before it is started.
Non-compliance with safety instructions described herein can be a source of danger for people, the environment and the machine, and voids any right to make claims to C.D.R. Pompe S.p.A.
The limits provided in this manual or in any documents provided with your pump must never be exceeded.

2.2 Symbols and signs

STOP	**WARNING**: Indicates an operation that requires extreme care.
	DANGER: POWER SUPPLY Possible danger caused by the presence of electric fields or live wires.
	DANGER MAGNETIC FIELD Indicates the presence of high intensity magnetic fields.
	GENERAL DANGER: Potential source of danger for whoever is working on the pump unit.

2.3 Operator qualification and training.

The personnel in charge of the installation, the operation and maintenance of the pump unit we produce must be qualified and able to perform the operations described in this manual.
C.D.R. Pompe S.p.A. shall not be held responsible for the training level of personnel and for the fact that they are not fully aware of the contents of this manual.

2.4 Safety Instructions

FOR YOUR OWN SAFETY:

BEFORE UNDERTAKING ANY SERVICE OPERATION ON YOUR PUMPS, PLEASE MAKE SURE TO WEAR THE PROPER PROTECTIVE GEAR

Do not perform any maintenance operation on the pump while it is running or before it has been disconnected from the power supply.

Always disconnect the unit.

Avoid any possible hazard that might be caused by electric power (for details see current regulations in force).

Do not start nor execute running tests before filling the pump with liquid.
Check the electrical specifications on the motor data plate and make sure they correspond to the power supply to which it will be connected.

Avoid pumping liquids, even at different times, that may cause chemical reactions.
Always clean the pump thoroughly before changing liquid.

Mag-Drive pumps use wide range, high intensity magnets.
All pacemaker carriers must not approach magnetic components; intense magnetic fields can disturb heart pace.
The cold or hot parts of the pump unit must be protected to avoid accidental contacts.
We remind you that the maximum effective surface temperature depends above all from the operative conditions of the process liquid of the user (UNI EN 13463-1 art.6.1.3).
Do not tamper with the protection of the rotating parts, do not touch or approach rotating parts while running.

Always avoid the dry operation of the pump. Start the pump when it is completely filled and with the delivery valve almost closed, limiting this condition to the time that is strictly necessary to start the pump.

It is not recommended to use liquid with suspended solids, especially if sensitive to magnetism.
In case dirty liquids are to be pumped and this was not mentioned at the time of ordering, it is necessary to contact C.D.R. Pompe S.p.A.'s technical service before activating the pump.

Do not submit pumps to abrupt temperature variations.

Clean the pump before performing service on it!

Corrosive and dangerous liquids contained in the pump could present a thread to your safety!

After service, start the pump again following all the safety instructions described in chapter 6 "Starting and stopping".

2.5 Noise Level

ETN Lined pumps, including the motor, in normal operating conditions (Qopt) produce a sound level below 80 dBA.
The major sources of noise are: liquid turbulence in the plant, cavitation or any other abnormal operation that does not depend from the pump construction nor the pump manufacturer. The user must provide suitable protective means if the sources of noise could produce a harmful noise level for operators and for the environment (in compliance with current regulations).

2.6 Modifications and Spare parts

Any changes concerning the service of the pump as originally purchased, can be executed only after written approval from C.D.R. Pompe S.p.A.
It is recommended to use only genuine CDR spare parts and approved accessories. The use of non-original spare parts or non approved accessories will void warranty and removes any responsibility on our behalf for any damage caused to people or things.

2.7 Safety in explosive environments

It is user's responsibility, when ordering the pump,to verify that the fluid temperature is suitable for the classification zone of the plant. *We remind you that the maximum effective surface temperature depends above all from the operative conditions of the process liquid of the user (UNI EN 13463-1 art.6.1.3).*

ETN pumps are built in accordance with 94/9/CE – ATEX Group II, class 2G standards.
The maximum operating temperature allowed for this pump model is 80°C with PP wet-end and 90°C with ETFE+PC wet ends.
The user must verify and insure that such temperature limits are not exceeded.

Motor
Whenever the motor is purchased separately from the pump, please make sure it does meet the protection parameters specified for the application area indicated by the Customer/User.

Spark-proof ring
It prevents sparking caused by accidental contact between outer magnetic coupling and lantern due to bearing wearing.

Grounding
The pump motor unit and eventual base-plate are provided with separate grounding to prevent electrostatic load formation.
Their positioning is marked through international symbols..

It is the user's responsibility to grant that the pumps operating limits are strictly observed.
If this cannot be granted, it is the user's responsibility to use proper devices in order to make sure that the pump remains within the given parameters.

Recommended options

The user has to make sure that the pump units operating limits are observed. A most important issue is the operating temperature. If the user cannot grant the operating temperature is kept within the limits, he shall use appropriate control devices.

Wattmetric units
Will stop the pump in case of dry running conditions or overloads due to:

- accidental closing of the discharge / suction valve
- changing in liquid properties due to temperature variations

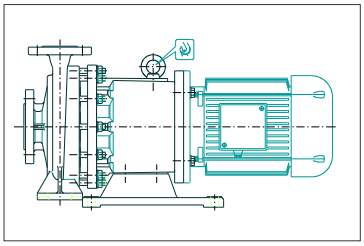
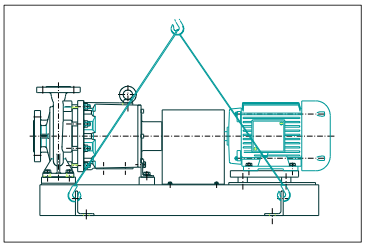
3 Packaging and Handling

3.1 Packaging

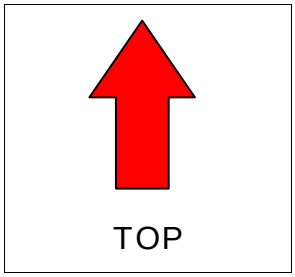
C.D.R. Pompe S.p.A. pumps or pumping units are normally packed either in cartons (maximum dimensions 800x600x400mm) held in place by foam, or fixed on pallets and wrapped with plastic film. In case of pumps ordered without electric motor, they are packed with the external magnetic core loose, which is kept in the packaging, separated from the pump and protected with foam/padding. Special packaging according to customer's request are available on demand to suit the type and means of transport. Packaging must be opened and handled according to the instructions shown on it.

3.2 Handling

To move cartons, crates or pallets weighing more than 20Kg, use a suitable means for the weight shown on the shipping document and always wear proper safety garments and gear. After un-crating your pump, always use hoist eyebolts, when available.
Close-coupled pumps, especially those with ADPE (Eex-D) motors could have unbalanced masses on the hoist fittings, therefore you should handle the units with all the necessary care. While moving the unit, avoid any impact that may damage the pump or the electric motor
When lifting, fasten the crate as shown.

To ensure that the crate, cartons or pallets are handled and lifted properly, read the symbols on the packaging. The following legend provides explanations for this purpose:



3.3 Shipping and Receiving

The goods we deliver undergo a control procedure and are approved before being released. It is, however, recommended to verify your incoming packages.
The contents of each package are described in the packing-list or in the delivery note. Run your check list carefully at the time of collection and possibly with the driver/carrier on site, check the integrity of the goods and packaging. Any claim must be made immediately by notifying the carriers and have them to sign the claim. In addition, check that the material received meets the order specifications (number and type of goods).

3.4 Storage

In case of storage, the pump must be placed in a dry, covered place and stored in its original packaging or equivalent protection.

The protecting caps and lids must be kept on the pump flanges until it is installed.

If the pump needs to be stored for long periods and/or in particularly severe environmental conditions, it is recommended to seal the pump packaging and use some hygroscopic substance (silica gel) to prevent moist damages.

4 Structural Description

4.1 Description

The **ETN Lined** is a centrifugal, single-stage pump with magnetic coupling, available in close-coupled version only. Its external parts are made of metallic material -Cast Iron- painted with one coat of epoxy varnish (dry thickness 60 μm) and two coats of polyurethane enamel RAL 1017 (dry thickness 50 μm).
Different painting coats or different finishing colours must be requested prior to ordering.
The parts in contact with the pumped liquid are made of thermoplastic material, either PP or ETFE.

The pump casing (lining) is manufactured with a particular moulding technology, called “transfert”, that allows to mould the corrosion resistant layer directly on the metallic shell, providing optimal grip on the metallic shell.

4.2 Construction and Operating

The main feature of your ETN pump is the movement transmission by means of a magnetic coupling. The external magnetic unit (847) is mounted on the motor shaft and transmits the torque to the internal magnetic core-impeller group (230) through a magnetic field. Such magnetic field generates a “coupling” and impeller rotation without physical contact. The isolation shell 151 is fitted between the two cores, hermetically sealing the pumped liquid from the atmosphere (see figure 1).

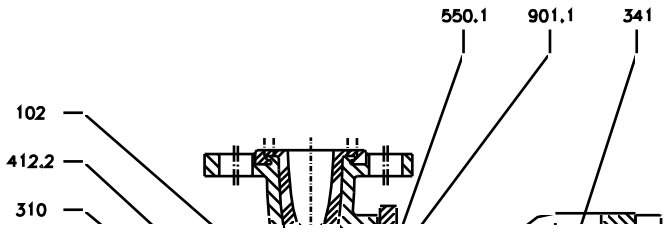
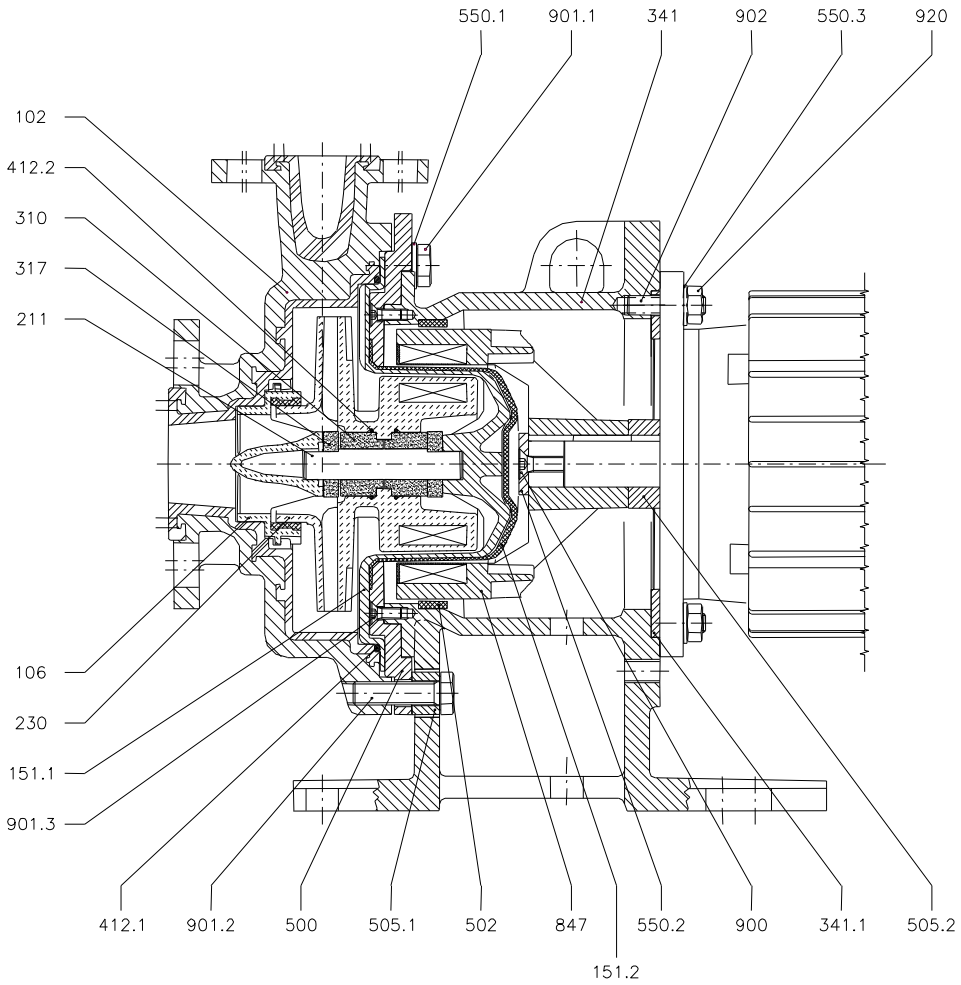


Fig.1

Typical section pump model ETN Lined
With motor 100/112 (PP execution)

Din Code	Description	Material
102	Pump Casing	PP + Cast Iron
106	Suction Casing	ECTFE
151.1	Isolation Shell	ETFE
151.2	Isolation Shell Cover	PC-CF
211	Shaft	Al_2O_3 / SiC
230	Impeller / Intern. Magnet	NdFeB + PP / ETFE
310	Rotating Bushing	Graphite LF / SiC / Al_2O_3 +PTFE
317	Static Bushing	Al_2O_3 / SiC
341	Lantern	Cast Iron
412.1	O-Ring – Casing	Viton® / EPDM / Viton® -FEP
412.2	O-Ring – Bushing	PTFE
500	Lantern Flange	Carbon Steel
502	Sparkproof Ring	Bronze
505.1	Spacer	AISI 316L
550.1	Washer	AISI 304
550.2	Washer	Carbon Steel
550.3	Washer	AISI 304
847	External Magnet Assembly	NdFeB + Ryton® PPS / Fe510
900	Screw	AISI 304
901.1	Bolt	AISI 304
901.2	Bolt	AISI 304
901.3	Screw	AISI 304
901.4	Bolt	AISI 304



Typical section pump model ETN Lined
With motor 100/112 (ETFE execution)

Din Code	Description	Material
102	Pump Casing	ETFE Cast Iron / PFA cast iron
106	Suction Casing	ECTFE
151.1	Isolation Shell	ETFE
151.2	Isolation Shell Cover	PC-CF
211	Shaft	Al_2O_3 / SiC
230	Impeller / Intern. Magnet	NdFeB + PP / ETFE
310	Rotating Bushing	Graphite LF / SiC / Al_2O_3 +PTFE
317	Static Bushing	Al_2O_3 / SiC
341	Lantern	Cast Iron
412.1	O-Ring – Casing	Viton® / EPDM / Viton® -FEP
412.2	O-Ring – Bushing	PTFE
500	Lantern Flange	Carbon Steel
502	Sparkproof Ring	Bronze
505.1	Spacer	AISI 316L
550.1	Washer	AISI 304
550.2	Washer	Carbon Steel
550.3	Washer	AISI 304
847	External Magnet Assembly	NdFeB + Ryton® PPS / Fe510
900	Screw	AISI 304
901.1	Bolt	AISI 304
901.2	Bolt	AISI 304
901.3	Screw	AISI 304
901.4	Bolt	AISI 304

5 Installation and Assembly

5.1 General Instructions

Install the pump in a place where servicing can be carried out easily. The delivery and suction piping as well as the foundation work must be prepared in compliance with the dimensions shown in the overall drawing or installation plan. The diameter of the piping shall never be smaller than the suction/delivery nozzles of the pump.

Electrical units that operate in areas in which there is a danger of explosion must comply with current regulations in force; this information must be shown on the motor data plate.

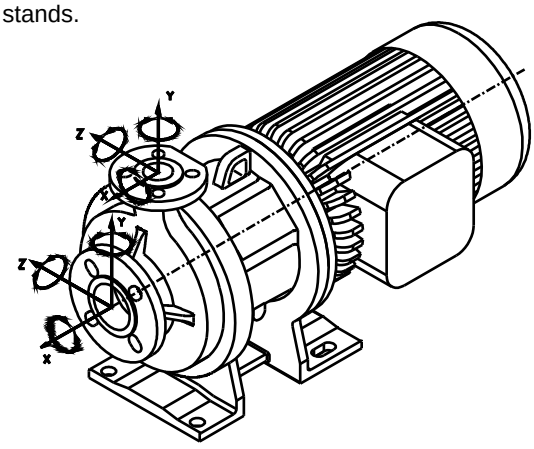
Whenever there is a danger of explosion, follow the prescriptions concerning Ex protection and the test certificate. The certificate must be kept next to the machine it belongs to.

If flammable liquids are pumped, provide all pump components with proper grounding: static currents may cause sparks and explosions.

STOP C.D.R. Pompe S.p.A. shall not be held responsible for any damage to people or objects due to incorrect assembly or assembly performed by unqualified personnel.

5.2 Installation

The pump-motor unit must be installed to a solid structure strong enough to support the entire area on which the unit stands.
Concrete foundations on a firm ground are the most satisfactory.
Once the pump-motor unit is in position, complete levelling by adjusting or adding metal shims placed between the feet and the surface on which it stands.



The shims must be placed in direct contact with the foundation bolts and they must be sufficiently wide to cover the largest possible surface. Check that each foot of the pump-motor unit stands steady and flat on the foundation however, this position must be set before tightening the nuts of the foundation bolts. The surface on which the foundation stands must be flat and horizontal. If the pump unit is fitted on a steel structure, make sure that it is properly supported and the feet do not bend.
CDR recommends to fit some rubber vibration-dampener between the pump and the brickwork.

The ETN Lined pump is close-coupled type thus pump-motor alignment is not required.

5.3 Plumbing

5.3.1 General Instructions

A pump is generally part of a plumbing system that can include a number of components such as valves, fittings, filters, expansion joints, instruments, etc. The way the piping is arranged and the positioning of the components have a great influence on operation and the life of your pump. The pump cannot be used as a support for the components connected to it. All piping should be indipendently and properly supported. Piping should not exert any stress on the pump flanges.
Before installation, remove the pump suction and delivery protection caps.

5.3.2 Max. acceptable Stresses on flanges.

STOP The forces and momentum transmitted to the pump by the piping system shall never exceed the values reported in the following table.

Forces		
Z (N)	X (N)	Y (N)
210	255	325

Momentum		
Z (Nm)	X (Nm)	Y (Nm)
85	170	112

The thermal expansion of pipelines requires the installation of expansion compensators.

All flanges must be centred before tightening the bolts. DO NOT try to pull or straighten the piping by tightening the bolts of the flanges or threaded fittings.

The suction and delivery piping, valves or filters installed nearby must be self supported and so that no strain is discharged on the the pump.

The piping must be clean and free from debris (welding slag, chip, etc.)

The flow of liquid from and to the pump must be as even as possible. We suggest to avoid any tight bends or drastic reductions of diameters that may cause major friction losses in the plant. In case diameter reductions are required, it is recommended to use appropriate conical reductions (possibly eccentric on suction side and concentric on discharge side) and the distance from pump flanges must be equal or more than five diameters.

5.3.3 Delivery Piping

A foot-valve and a cut-off/regulation valve are normally fitted on the discharge piping.
The foot-valve protects the pump from possible backflow. The cut-off/regulation valve excludes the pump from the line and adjusts output.

Never adjust flow-rate using the valve on the suction pipe.

5.3.4 Suction Piping

The suction piping is very important for the correct operation of your pump.

ETN Lined pumps are single-stage centrifugal type, and **non-self-priming** therefore the suction must be flooded at start up. Also, the suction line must provide sufficient pressure and smooth flow to pump inlet to prevent pump cavitation.
The suction piping must be as short and as direct as possible. Elbows, fittings or valves installed close to the suction can disrupt liquid flow and cause malfunctions. If a long suction line is needed, the diameter should be large enough to ensure low friction losses.
Air entrapment in the suction line because of leaks or improper design may cause the pump to lose prime and fail.

It is always necessary to install a foot valve in all those cases where the static height of the liquid is lower than the suction height of the pump.

The suction piping must be designed to prevent air from being trapped in high spots in the piping. This condition may cause the pump to vapor lock as the air bubble moves into the pump. Critical points in the system could be the seals between flanges and the seals of the valve stems. **ETN Lined** pumps can become self-priming if equipped with a priming barrel (for any further information please get in touch with C.D.R. Pompe S.p.A.'s technical service).

5.3.5 Instruments

In order to ensure a reasonable control of the performance and the conditions of the pump installed, we recommend to use the following instruments:
- a vacuum gauge on the suction piping
- a pressure gauge on the delivery piping

The pressure intakes must be made on straight pieces of piping and placed at minimum five diameters from the pump inlets. The pressure gauge on delivery must always be fitted between the pump and the cut-off/regulation valve. The output can be read on the pressure, transformed into meters and then compared with the typical curves.
The electric power absorbed by the motor can be measured with watt-meters. Optional instruments can warn about abnormal operating conditions of your pump such as: valves accidentally closed, missing liquid, overloads, etc. (for any further information please contact C.D.R. Pompe S.p.A.'s technical service). If the temperature of the pumped liquid is a critical element, provide a thermometer (best on suction).

5.4 Connecting the Motor

WARNING!

Ground motor before connecting to electrical power supply. Failure to ground motor can cause severe or fatal electrical shock azard. Do not ground to gas supply line.

Electrical connection must always be executed by a certified electrician.
Match voltage to nameplate voltage on motor pump! Incorrect voltage can cause fire or seriously damage motor, voiding warranty.

Connection is stated on the motor data plate and can be **Y** (star) or Δ (Delta), according to the power supply of the motor (see figure).

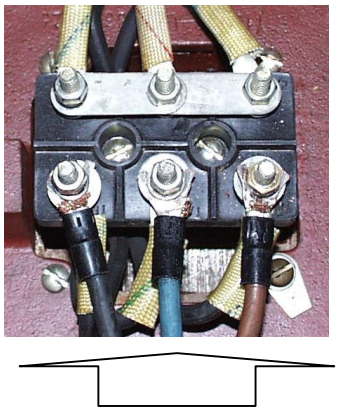
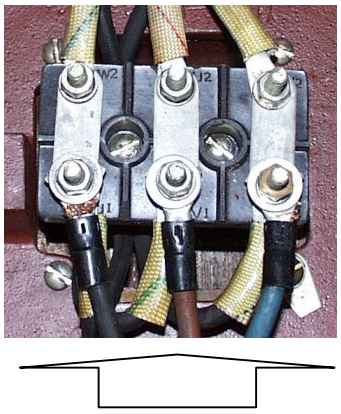
Follow the prescriptions of the local electricity board for the connection.

In no case connect the electrical motors directly to mains but also fit in between a suitable electric switchboard equipped with a circuit breaker and suitable safety devices. The motor must be protected from overloads by suitable meanings.

Before applying power to the motor, check that the motor/impeller is free to turn, by manually moving the motor cooling fan.

Always verify the motor rotation before starting regular operation.

The motor must turn in the same direction as the arrow shown on the pump lantern. The rotation however, must always be clockwise looking at the pump on the motor side.

Y Star connection	Δ Delta connection
	
Power inlet	Power inlet

6 Operating the Pump

6.1 General Prescription

Check manually that the motor is free to turn, moving the motor cooling fan.

Make sure that the piping is not clogged and is free from residues, solid particles or crystals from the pumped product.
In case of installation on new or modified plants, it is recommended to use temporary filters (strainers, socket type) placed on the suction line.
Should the liquid to be maintained at a prescribed temperature to avoid crystallization or solidification, heat piping in accordance with the type of piping or plant needs.

Make sure that the liquid flows regularly into the pump.

The pump and piping connected to the suction side, must be flooded. Any air or gas must be carefully released.
In case of suction with negative head, fill the suction piping and check how the bottom valve works. It must guarantee that the liquid does not flow back, emptying therefore the suction pipe with consequent unpriming of the pump.

The suction cut-off valve (if any) must be completely open.
The cut-off/regulation valve on the discharge side must be almost completely closed.

The motor must turn in the same direction as the arrow shown on the pump.

The direction of rotation is always clockwise looking at the pump on the motor side; check by starting briefly, then looking at the direction of rotation of the motor fan through the fan lid. If it is wrong, the motor must be stopped immediately. Change the connection to the terminals of the electric motor (Par. 5.4 “Motor connection”) and repeat the procedure described above.

All eventual auxiliary connections must be connected and verified.

6.2 Starting the Pump

Start the electric motor and open the delivery adjustment/cut-off valve gradually until the desired output has been reached.
The pump must not turn more than two or three minutes with the cut-off valve closed. A longer operation in these conditions could seriously damage your pump.
If the pressure shown on the pressure gauge on the delivery piping does not increase, turn the pump off immediately and carefully release pressure. Repeat the connection procedure (Paragraph 5.3 “Piping connection”).
If there are changes of flow-rate, head, density, temperature or viscosity of the liquid, stop the pump and get in touch with C.D.R. Pompe S.p.A.’s Technical Service.

6.3 Re-starting after power cut-off

In case of accidental stopping, make sure that the non-return valve has prevented backflow and check that the motor cooling fan has stopped. Start the pump again following the instructions of paragraph 6.2 “Starting the Pump”.

pump intakes from a lower level, it can unprime during the standstill and therefore you must check again before starting that the pump and the suction piping are full of liquid.

6.4 Stopping the Pump

Close the delivery adjustment/cut-off valve gradually and stop the motor immediately after. Make sure that the motor has an even deceleration.
Stopping the pump before closing the cut-off valve is not recommended, especially with larger pumps or long delivery piping. That is to avoid damages due to liquid backflow hammering (ram head). If a suction cut-off valve has been installed, it is advisable to close it completely.

In some cases (e.g. if the pump is used to empty tanks or tank trucks), it may occur that the liquid stops flowing into the pump while still operating.

In this case the pump runs without liquid and can be seriously damaged if the condition persist. Pump must be stopped immediately. If the pump is not built with the limited dry running protection (FTC ^{TM} system) and no automatic safety devices (optional) are installed, it is necessary to ensure the constant presence of an operator who can promptly stop the pump and perform the above-mentioned operations.

Consult C.D.R. personnel to choose the proper instrument for your pump suited to prevent dry running operation.

6.5 Periods of long inactivity

6.5.1 The pump is left in place

To avoid substances settling inside the pump because of a long period of inactivity, start the pump for about five minutes periodically (about twice a month). The same applies to pumps in stand by.

6.5.2 The pump is removed and stored

If the pump has to be removed and stored, proceed according to the instructions contained in paragraphs 6.4 “Stopping the pump” and 7.1 “General Maintenance Information”.
Protect the suction/delivery nozzles (use the caps supplied).
When handling the pump, follow the instructions contained in paragraph 7.2 “Pump handling” and then store the pump as described in paragraph 3.3 “Storage”.

7 Maintenance

7.1 General Maintenance Information

During the warranty period, no operations must be performed other than by personnel from, or authorized in writing by C.D.R. Pompe S.p.A. All the stages described in this chapter must be carried out by qualified personnel, following all the procedures described herein, step by step.

Each operation carried out on the machine must always be carried out once all the electrical contacts have been disconnected.

The pump-motor unit must be placed in a position where it cannot be started inadvertently.

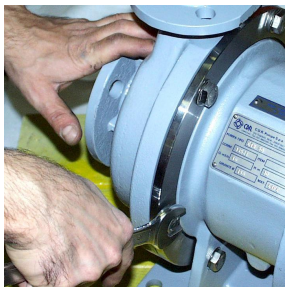
Before servicing in any way the parts in contact with the pumped liquid, make sure that the pump has been fully emptied and washed.

When draining the liquid make sure that there is no danger for people or the environment.

For Pump Handling procedures, please see paragraph 3.2 “Handling” on page 9

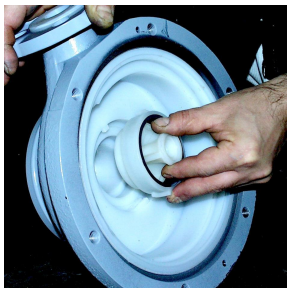
7.2 Dismantling the Pump

For **ETN Lined** pumps with B5 frame motors (fig.2) assuming that the complete pump is removed from piping:



Remove the pump casing (9) from the lantern flange (15), connected to the lantern (8), by removing the screws (10) and washers (12).

Remove the suction cover (11) from the casing (9).



Pull out the axial thrust shoe (7) from the shaft (1) and remove the magnets/impeller unit (6) with the rotating bushings (5) + (4) from the shaft (1).

Remove the rotating bushings (5) and (4), the O rings locking the bushings (21) and (22) from the impeller (6).

STOP

The shaft, the static and rotating bushings are usually made from very fragile, sintered material and hence must be handled with extreme care.

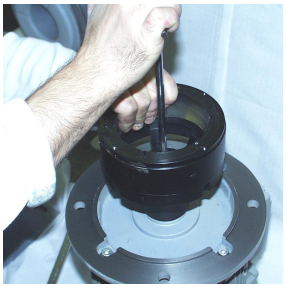
Remove the O-ring (18), the shaft (1) and the axial thrust shoe (2) from the isolation-shell (3).

Remove the isolation shell (3) from the lantern flange (15) connected to the lantern (8).

Dismantle the lantern flange (15) from the lantern (8) by removing the screws (23).

Remove lantern (8) from the motor (13), removing the screws (19) and the washers (20) freeing the external magnetic drive (14).

Remove the screw (16) and the washer (17) and extract the external magnetic drive (14) from the drive shaft(13).



<u>Pumps equipped with motor size 80 - 90 with frame B3-14 (pic. 3):</u>

dismantle the motor removing the nut (27) and the washer (26) from the rod (24), pull out the motor together with the lantern adaptor flange (25).

<u>Pumps equipped with motor size 132 with frame B3-14 (pic. 4):</u>

dismantle the motor removing the screw (30) and the washer (29) and detach it from the flange (28).

7.3 Maintenance Schedule

The **ETN Lined** pumps have been designed and tested to run for a minimum operating time of 8000 hours assuming ideal working conditions.

This figure is conservative and can change according to the duty point of your pump. Moreover, factors such as intermittent operation, type of pumped liquid, installation and location in the plant may affect the life of those components subject to wear and tear.

C.D.R. Pompe S.p.A. also recommends to perform preventive maintenance service on the pump at least once a year, even when used in ideal operating conditions.

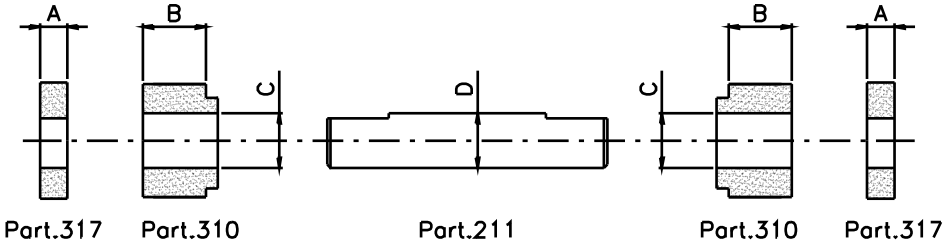
7.4 Wear Parts Check and Replacement

In your pumps there are some parts that, by nature, are subject to wear and tear and that require periodic maintenance and/or verification:

1. Casing gasket (412.1)
2. Bushings O-rings 412.2)
3. Rotating bushings (310)
4. Static shaft (211)
5. Axial thrust shoe (317)

We suggest replacing the casing gasket and O rings locking bushings (412.2) every service job or every time the pump is opened. On the contrary we suggest replacing bushings, shaft and axial thrust shoe only when, after measuring, the critical sizes are in the limit field compared to the figures contained in the following table.

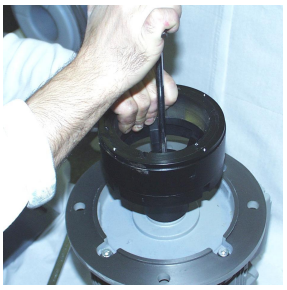
Description	Re.	Dim.	Nominal Value (mm)	Limit Value (mm)
Axial Thrust Shoe	317	A	$8\ ^{0}_{-0.2}$	≤ 7.6
Rotating Bushing	310	B	$18.5\ ^{0}_{-0.2}$	≤ 18.1
		C	$\varnothing 16\ ^{0.05}_{0}$	≥ ∅16.2
Shaft	211	D	$\varnothing 16\ ^{-0.05}_{-0.10}$	≤ ∅15.75



To ensure the correct operation of the pump always use original CDR spare parts. When ordering spare parts, provide the pump serial number and the reference code for the required item. This will help us to expedite the whole order processing.

7.5 Assembling the Pump

For **ETN Lined** pumps with B5 frame motors (pic. 2) assuming that the complete pump was removed from piping:



Fit the external magnetic assembly (14) on the motor shaft(13) and tighten the mounting screw (16) with washer (17).

Mount the lantern (8) on the motor flange and lock it with screws (19) and washers (20).

Mount the lantern flange (15) onto the lantern, (8) and lock screws (23)

With the isolation shell in your hands:
Fit the axial thrust shoe (2) on the shaft (1) inserting the assembled pieces in the isolation shell (3).

Insert the O rings that lock the rotating bushings into the impeller (6).

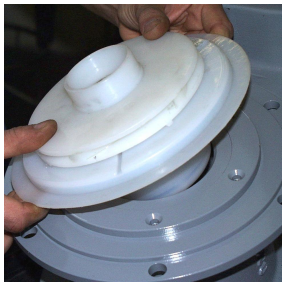
Insert the rotating bushings (4) + (5) in the impeller (6).

The shaft, the static and rotating bushings are usually made from very fragile, sintered material and hence must be handled with extreme care.

Mount the assembled impeller-rotating bushings unit on the shaft (1).

Add the front axial thrust shoe (7) on the exceeding shaft section(1).

Warning! The magnetic attraction between impeller and the external magnetic core may injure your hands. Handle with care when re-assembling the pump!

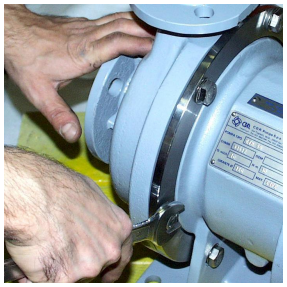


Fit the isolation shell (3) on the lantern flange (15) with the assembled impeller group.

Place the O-ring (18) on the isolation shell, making sure it sits perfectly on the rim.

Fitting of the O ring (18) must be made with extreme care and make sure that its sealing capabilities are not affected or compromised .

Install the pump casing (9) onto the lantern flange (15) with screws (10) and washers (12).



Pumps equipped with motor size 80 - 90 with frame B3-14 (pic. 3):

Fit the motor together with adaptor flange (25) onto the lantern and tighten the nut (27) with the washer (26) on the rod (24)

Pumps equipped with motor size 132 with frame B3-14 (pic. 4):

Fit the motor on the lantern together with the flange (28) and tighten the screw (30) with the washer (29).

7.6 Screws recommended locking torque

Please refer to the following table to set proper wrench torque when locking the pump screws, bolts and nuts.

Part n°	Description	Thread	Locking torque
901.1	Pump casing screws	M12	11 Nm
901.2	Pump casing screws	M12	11 Nm
900	Motor shaft screw (gr.80)	M6	9 Nm
900	Motor shaft screw (gr.90)	M8	9 Nm
900	Motor shaft screw (gr.100/112)	M10	10 Nm
900	Motor shaft screw (gr.132)	M12	11 Nm
901.4	Motor screws or nuts (gr.80/90)	M10	10 Nm
901.4	Motor screws (gr.100/112/132)	M12	11 Nm
901.3	Lantern flange screws	M6	9 Nm

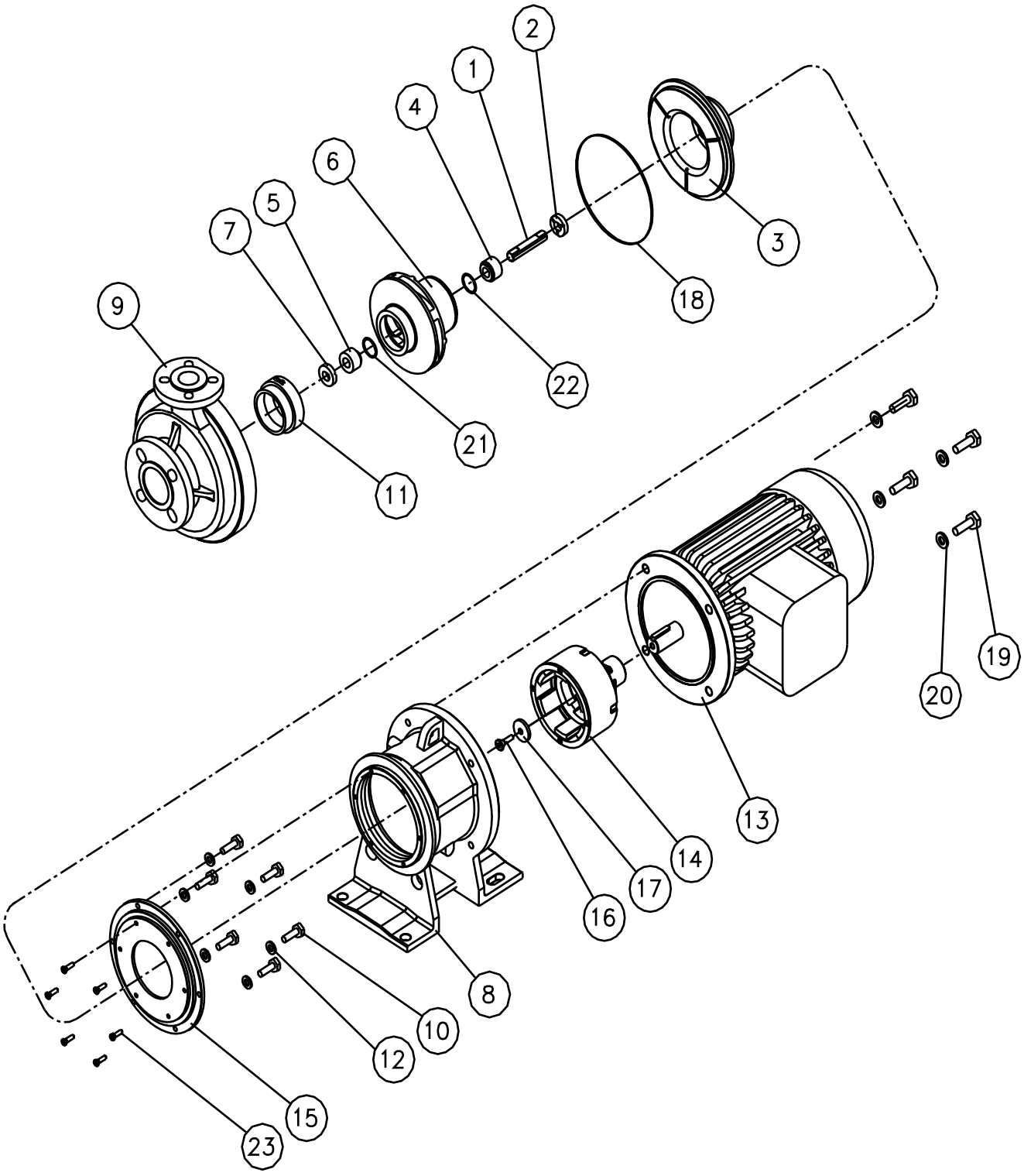


Fig.2

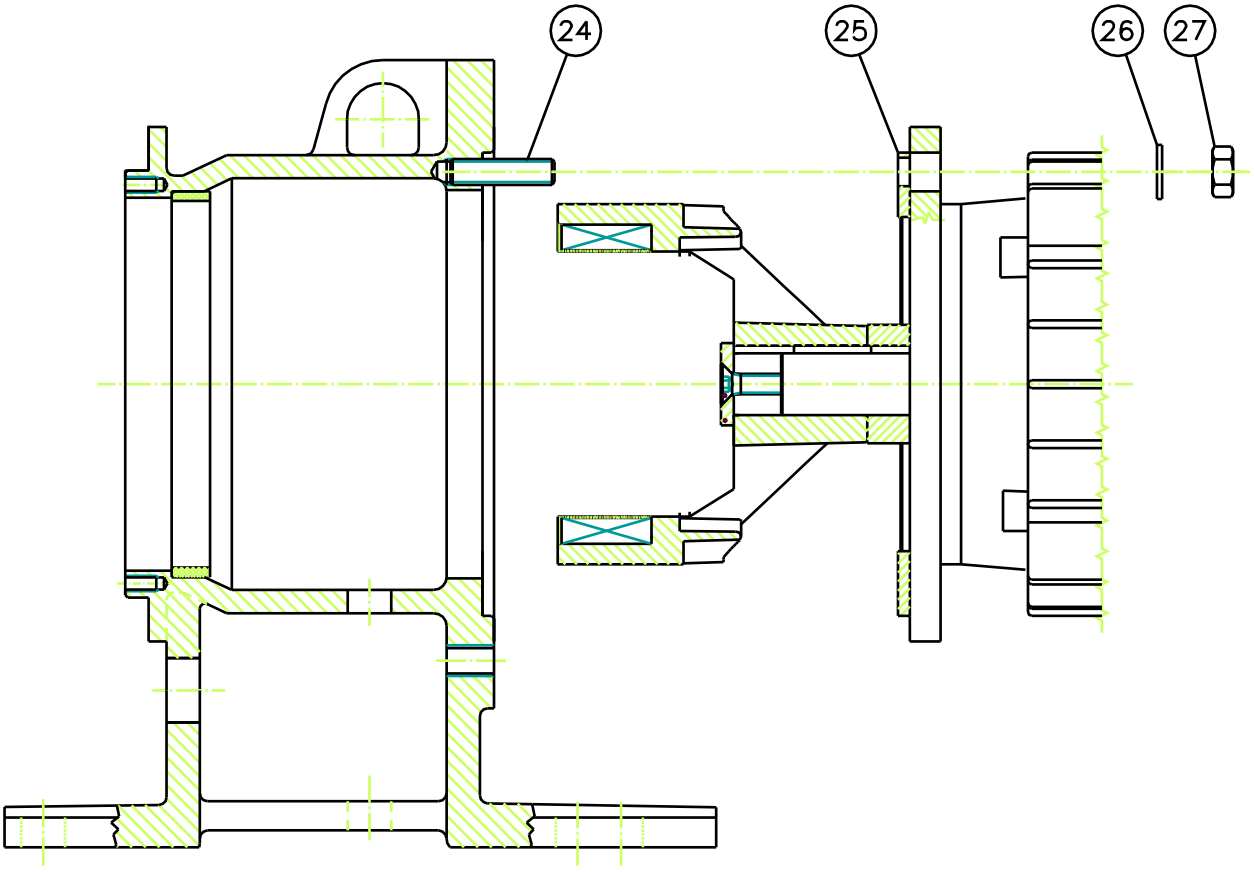


Fig. 3

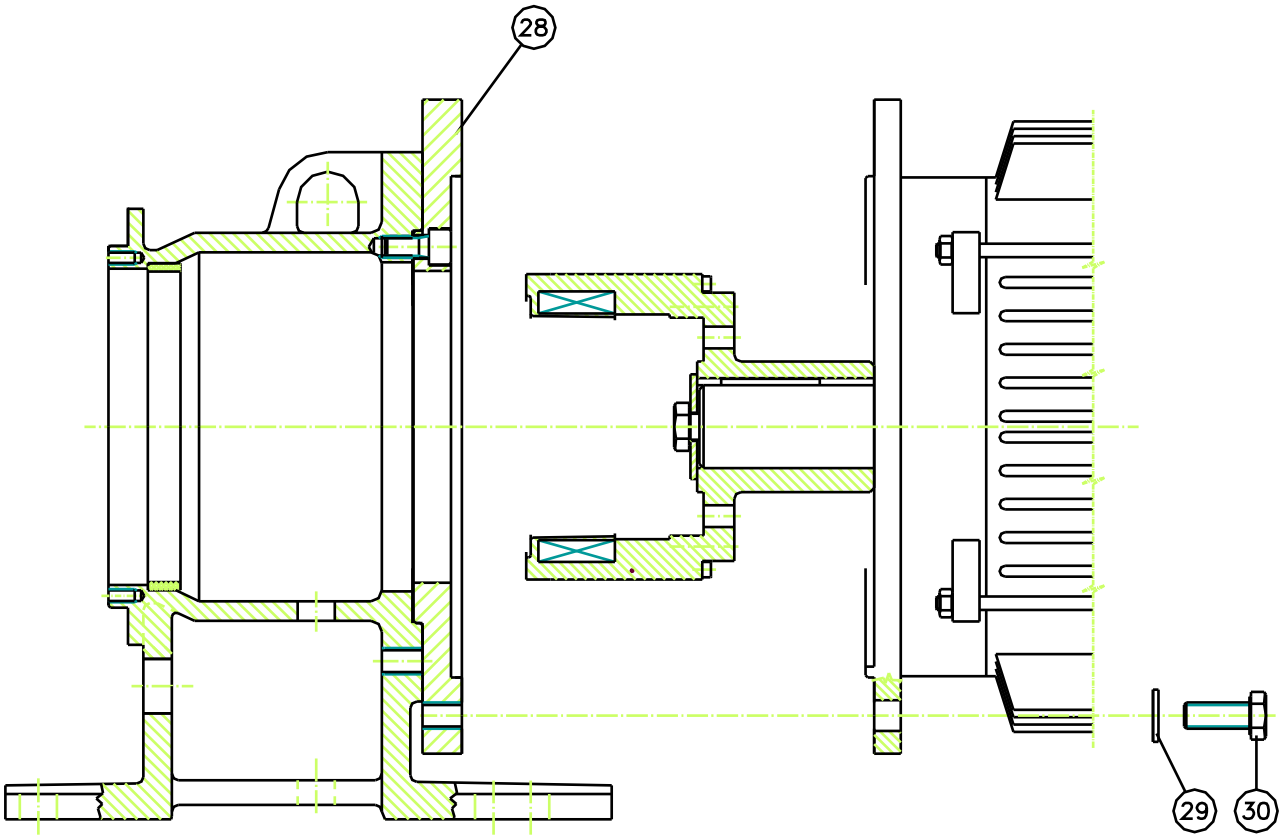


Fig. 4

8 Troubleshooting

8.1 General Information

The following tables can help you to identify some possible causes for pump failures or problems you might encounter during operation. Identify on the left column of table "**A**" **(symptoms)** the problem encountered and read on the right column **(causes)** the reference number. Look for the probable reason for the malfunctioning and/or solution on Table "**B**" (Page 25). Excluding the causes not applicable to the case being examined, you can identify the source of the problem.
If the pump malfunctioning is identified with a number marked with **#,** we recommend to contact our after sales service for further support.

Warning:

In compliance with the Italian law 626/94 on workplace safety, our service centre will not repair nor work on pumps and components that have not been perfectly cleaned. We regret that we shall be forced to return any pump that, in our indisputable opinion, is not sufficiently clean.

Table "A"	
Problems	**Possible Causes**
Pump does not have required head	1,2,3,4,9,10,11,12,14,15,17,18,19,24,29,32
Insufficient flow rate	2,3,4,5,6,7,8,9,10,11,12,14,15,17,18,29,32
Low delivery pressure	9,12,14,15,17,18,21,29
Pump unmprimes after startup	2,3,4,9,10
Leaks from pump	14,19,21,23,24,25,27,33
Abnormal power absorption	13,16,17,18,21,23,24,25,26,28,30
Vibrations and unnatural noises	2,3,6,7,9,10,11,16,19,21,24,26,27,28,29,30,31,32
Bushing life too short	27,28,29,33
The pump overheats	1,6,9,13,19,20,24,26,28

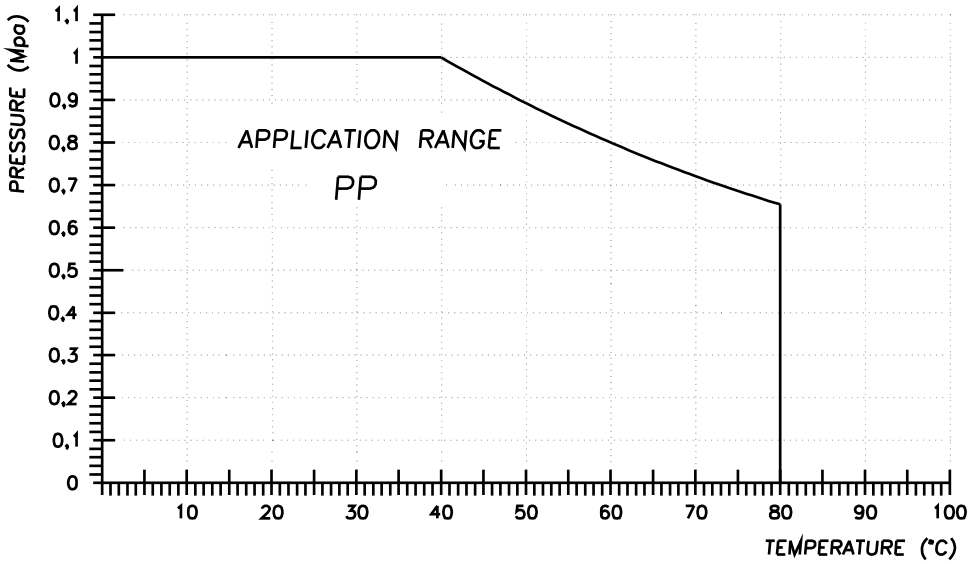
Table “B”	
1	The Pump is not primed
2	Suction height too high
3	Suction piping or pump is not completely filled with liquid
4	Suction piping with air pockets
5	Insufficient suction pressure
6	Vapour pressure is too high
7	Suction piping has higher friction losses than calculated
8	Insufficient suction head
9	Too much air or gas in the pumped liquid
10	Suction piping not sealed
11	Foot-valve not sealed or clogged
12	Low rotation speed
13	High rotation speed
14	Wrong direction of rotation
15#	The plant total required head higher than what delivered by the pump
16	The plant total required head lower than what delivered by the pump
17#	Liquid density differs from the expected one (specified at purchase time)
18#	Liquid viscosity differs from the expected one (specified at purchase time)
19	Pump operating without liquid -dry running-
20	Operating flowrate too low
21	Operating flowrate too high -pump cavitates-
22#	Material not suitable for the pumped liquid
23#	Pumped liquid with suspended solid
24#	Liquid temperature too high
25#	Liquid temperature too low
26	Insufficient pressure or bushing lubrication/cooling (flushing flow)
27	Shaft is not straight
28	Rotating parts are rubbing against casing/isolation shell
29	Damaged impeller
30	Internal bushings worn or damaged
31	Rotating unit out of balance
32#	Magnetic coupling damaged, demagnetized or insufficient
33	Wrong assembly, dirt/solids presence, or liquid non compatible

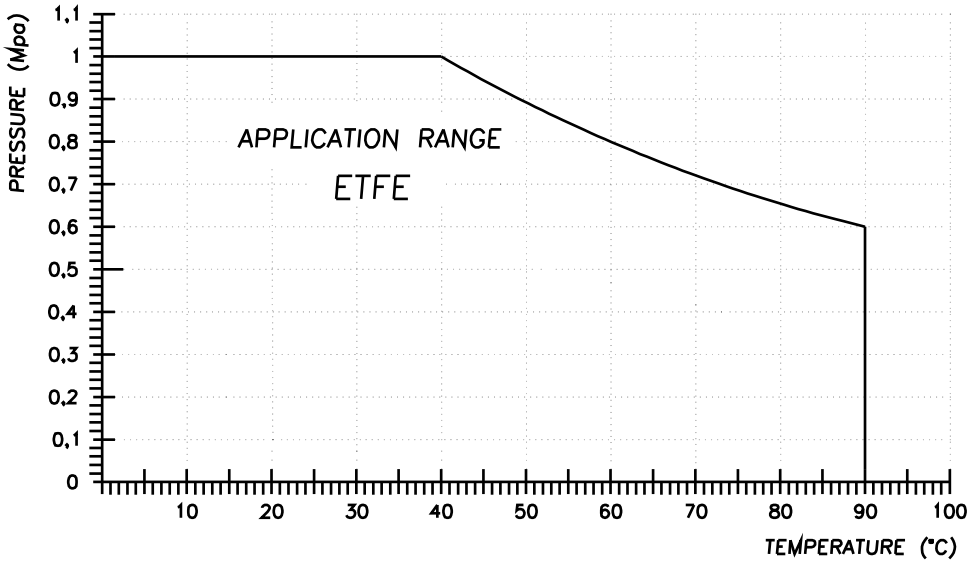
9 Tables and Charts

9.1 Features Table

FEATURES	DESCRIPTION
Pump Type	Close coupled pump with motor frame B5
Materials	PP / ETFE
Pumped Liquids	CORROSIVE, INFLAMABLE AND TOXIC LIQUIDS
Performance Limitations	Q max = 80 m^3/h -> H max = 34 mcl
Drives	0,75 Kw (size 80) -> 7,5 Kw (size 132)
Temperature Range	-5°C -> +90°C
System Pressure Ratings	PP From PN 6 (@ 20°C) to PN 4 (@ 80°C) ETFE From PN 6 (@ 20°C) to PN 4 (@ 90°C)
Viscosity	400 cSt max
Solids	2 % max concentration in weight Max. Hardness 700 Vk / Size 150 µ

9.2 Application Limits and Selection Chart

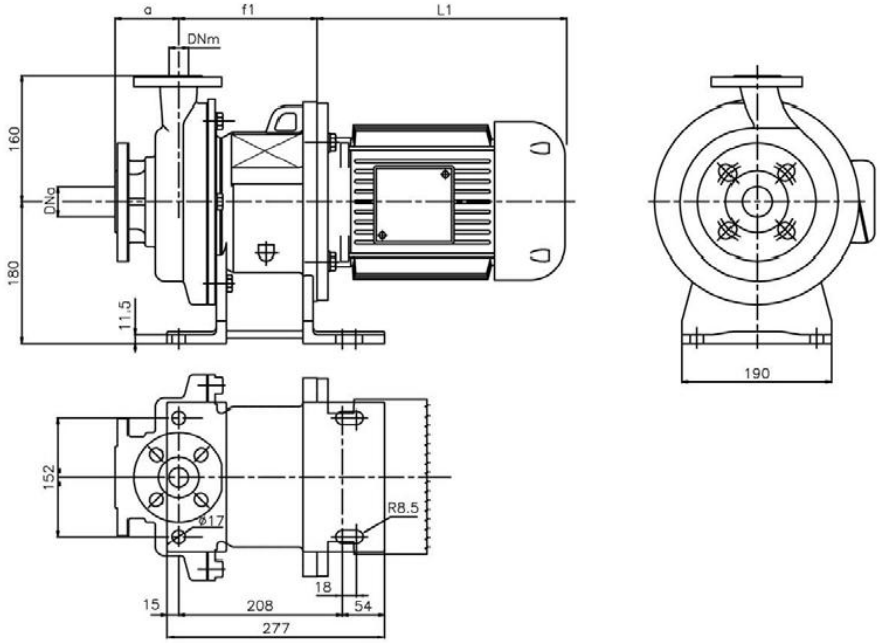




Pump selection chart based on the operating temperature and internal system pressure (1 Mpa = 10,2 bar = 10,2 Kg/cm2)

STANDARD ETN Lined - DIMENSIONS

Drive Size 80-90-100-112-132



General dimensions

Pump type	Dna	DNm	a	Motor		Motor dimensions L1	
				Size	f1	TEFC	ADPE
ETN 50	40 UNI 2223/20 PN 16 ANSI B16.5 150 RF	25 UNI 2223/20 PN 16 ANSI B16.5 150 RF	80	80	125	175.5	233	200
				90	125	175.5	236	203
60	65 UNI 2223/20 PN 16 ANSI B16.5 150 RF	40 UNI 2223/20 PN 16 ANSI B16.5 150 RF	80	100	125	175.5	314	300
			100	112	125	175.5	323	415
80	UNI 2223/20 PN 16 ANSI B16.5 150 RF	50 UNI 2223/20 PN 16 ANSI B16.5 150 RF	100	132	125	193.5	400	503

ETN ...

ETN 70

Pump weight

Size	Motor weight (Kg)		Pump weight with motor (Kg)	
	TEFC	Eex	TEFC	Eex
80	19.5	24.4	51.5	56.4
90	24.5	34.5	56.5	66.5
100	35.5	40	67.5	72
112	45	65	77	97
132	65	80	100	112
80	19.5	24.4	51.5	56.4
90	24.5	34.5	56.5	66.5
100	35.5	40	67.5	72
112	45	65	77	97
132	65	80	100	112
80	24.4	30.5	61.4	
90	34.5	61.5	71.5	
100	40	122.5	77	
112	65	82	102	
132	105		117	

Pump weight (Kg)	
ETN 50	32
ETN 50	32
ETN 50	32
ETN 50	32
ETN 50	32
ETN 60	32
ETN 60	32
ETN 60	32
ETN 60	32
ETN 60	32
ETN 70	37
ETN 70	37
ETN 70	37
ETN 70	37
ETN 70	37

Notes and Logbook

Tech-Books and User Manuals

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